TEST REPORT

DT&C Co., Ltd. 42, Yurim-ro, 154Beon-gil, Cheoin-gu, Yongin-si, Gyeonggi-do, Korea Tel : 031-321-2664, Fax : 031-321-1664	Report No : DRTFCC1605-0066 Pages:(1) / (93) page	Dt&C

1. Customer

   • Name : Hyundai MOBIS Co., Ltd.

   • Address : 203 Teheran-ro, Gangnam-gu, Seoul, Korea, 135-977

2. Use of Report : FCC & IC Original Grant

3. Product Name (FCCID, IC) : DIGITAL CAR AVN SYSTEM (TQ8-ACBB0G3AN, 5074A-ACBB0G3KN)

4. Date of Test : 2016-04-08 ~ 2016-04-14

5. Test Method Used: FCC Part 15 Subpart C.247
   RSS-247 Issue 1 (2015-05), RSS-GEN Issue 4 (2014-11)

6. Testing Environment : See appended test report

7. Test Result : ☒ Pass ☐ Fail

The results shown in this test report refer only to the sample(s) tested unless otherwise stated. This Test Report cannot be reproduced, except in full.

Affirmation	Tested by Name : JungWoo Kim (Signature)	Technical Manager Name : GeunKi Son (Signature)

2016 . 05 . 11 .

DT&C Co., Ltd.

* If this test report is required to confirmation of authenticity, please contact to report@dtnc.net

Test Report Version

Test Report No.	Date	Description
DRTFCC1605-0066	May 11, 2016	Initial issue

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1. General Information

1.1 Testing Laboratory

DT&C Co., Ltd.			
Standard		**Site number**	**Address**
FCC	☒	**165783**	42, Yurim-ro 154 beon-gil, Cheoin -gu, Yongin-si, Gyeonggi -do, South Korea 449-935
	☐	**804488**	42, Yurim-ro 154 beon-gil, Cheoin -gu, Yongin-si, Gyeonggi -do, South Korea 449-935
	☐	**596748**	42, Yurim-ro 154 beon-gil, Cheoin -gu, Yongin-si, Gyeonggi -do, South Korea 449-935
	☐	**678747**	683-3, Yubang-dong, Cheoin-gu, Yongin-si, Kyeonggi-do, Korea, 449-080
IC	☒	**5740A-3**	42, Yurim-ro 154 beon-gil, Cheoin -gu, Yongin-si, Gyeonggi -do, South Korea 449-935
	☐	**5740A-2**	683-3, Yubang-dong, Cheoin-gu, Yongin-si, Kyeonggi-do, Korea, 449-080
www.dtnc.net			
Telephone	:	+ 82-31-321-2664	
FAX	:	+ 82-31-321-1664	

1.2 Details of Applicant

Applicant	:	Hyundai MOBIS Co., Ltd.
Address	:	203 Teheran-ro, Gangnam-gu, Seoul, Korea, 135-977
Contact person	:	Seung Hoon Choe

1.3 Description of EUT

EUT	DIGITAL CAR AVN SYSTEM
Model Name	FCC: ACBB0G3AN IC: ACBB0G3KN
Add Model Name	FCC: ACB10G3AX, ACB10G3GG, ACB11G3GG, ACB10G3BN, ACB10G3GE, ACB10G3GL IC: ACB10G3KN
Serial Number	Identical prototype
Hardware version	4.0
Software version	1.0
Power Supply	DC 14.4 V
Frequency Range	2402 MHz ~ 2480 MHz
Modulation Technique	GFSK, π/4-DQPSK, 8DPSK
Number of Channels	79
Antenna Type	Internal Antenna
Antenna Gain	PK : -0.10 dBi

1.4 Declaration by the applicant / manufacturer

- NA

1.5 Information about the FHSS characteristics

- This Bluetooth module has been tested by a Bluetooth Qualification Lab, and we confirm the following :
  - A) The hopping sequence is pseudorandom
  - B) All channels are used equally on average
  - C) The receiver input bandwidth equals the transmit bandwidth
  - D) The receiver hops in sequence with the transmit signal

- 15.247(g) : In accordance with the Bluetooth Industry Standard, the system is designed to comply with all of the regulations in Section 15.247 when the transmitter is presented with a continuous data (or information) system.
- 15.247(h) : In accordance with the Bluetooth Industry Standard, the system does not coordinate its channels selection / hopping sequence with other frequency hopping systems for the express purpose of avoiding the simultaneous occupancy of individual hopping frequencies by multiple transmitters.
- 15.247(h) : The EUT employs Adaptive Frequency Hopping (AFH) which identifies sources of interference namely devices operating in 802.11 WLAN and excludes them from the list of available channels. The process of re-mapping reduces the number of test channels from 79 channels to a minimum number of 20 channels.

1.6 Test conditions

Ambient Condition	
▪ Temperature	+22 ℃ ~ +24 ℃
▪ Relative Humidity	34 % ~ 39 %

1.7 Test Equipment List

Type	Manufacturer	Model	Cal.Date (yy/mm/dd)	Next.Cal.Date (yy/mm/dd)	S/N
MXA Signal Analyzer	Agilent	N9020A	15/09/14	16/09/14	MY50200834
DIGITAL MULTIMETER	Agilent	34401A	16/01/05	17/01/05	US36099541
DC Power Supply	SM techno	SDP30-5D	16/01/05	17/01/05	305DLJ204
Bluetooth Tester	TESCOM	TC-3000B	15/06/26	16/06/26	3000B640046
P-Series Power Meter Wideband Power Sensor	Agilent	N1911A	15/10/20	16/10/20	MY53360016
		N1921A			MY53360018
Power Splitter	Anritsu	K241B	15/06/25	16/06/25	017060
Thermohygrometer	BODYCOM	BJ5478	16/04/22	17/04/22	120612-2
Vector Signal Generator	Rohde Schwarz	SMBV100A	16/01/05	17/01/05	255571
Signal Generator	Rohde Schwarz	SMF100A	15/06/29	16/06/29	102341
LOOP Antenna	Schwarzbeck	FMZB1513	16/04/22	18/04/22	1513-128
TRILOG Broadband Test-Antenna(30MHz-1GHz)	SCHWARZBECK	VULB9160	14/07/31	16/07/31	9160-3363
Horn Antenna(1~18GHz)	ETS-LINDGREN	3115	15/02/09	17/02/09	9202-3820
Horn Antenna	A.H.Systems	SAS-574	15/04/30	17/04/30	154
EMI TEST RECEIVER	R&S	ESR7	15/10/19	16/10/19	101109
High-pass filter (3GHz)	Wainwright Instruments	WHKX3.0	16/01/06	17/01/06	12
High-pass filter (8GHz)	Wainwright Instruments	WHNX6-6320-8000-26500-40CC	15/09/23	16/09/23	1
Low Noise Pre Amplifier(10kHz-1GHz)	tsj	MLA-010K01-B01-27	16/03/10	17/03/10	1844539
PreAmplifier	Agilent	8449B	16/02/24	17/02/24	3008A00370

1.8 Summary of Test Results

FCC Part RSS Std.	Parameter	Limit (Using in 2400~ 2483.5 MHz)	Test Condition	Status Note 1
15.247(a) RSS-247(5.1)	Carrier Frequency Separation	>= 25 kHz or >= Two thirds of the 20 dB BW, whichever is greater.	Conducted	C
	Number of Hopping Frequencies	>= 15 hops		C
	20 dB Bandwidth	N/A		C
	Dwell Time	=< 0.4 seconds		C
15.247(b) RSS-247(5.4)	Transmitter Output Power	**For FCC** =< 1 Watt , if CHs >= 75 Others =< 0.125 W **For IC** if CHs >= 75 =< 1 Watt For Conducted Power =< 4 Watt For e.i.r.p, Others =< 0.125 W For Conducted Power. =< 0.5 Watt For e.i.r.p		C
15.247(d) RSS-247(5.5)	Conducted Spurious Emissions	The radiated emission to any 100 kHz of out-band shall be at least 20 dB below the highest in-band spectral density.		C
RSS Gen(6.6)	Occupied Bandwidth (99 %)	N/A		C
15.205 & 209 RSS-247(5.5) RSS-Gen (8.9 & 8.10)	Radiated Spurious Emissions	FCC 15.209 Limits RSS-Gen 8.9	Radiated	C Note2
15.207 RSS-Gen(8.8)	AC Conducted Emissions	FCC 15.207 Limits	AC Line Conducted	NA Note3
15.203 RSS-Gen(8.3)	Antenna Requirements	FCC 15.203	-	C

Note 1 : **C** = Comply **NC** = Not Comply **NT** = Not Tested **NA** = Not Applicable

Note 2 : This test item was performed in each axis and the worst case data was reported.

Note 3: This device is installed in a car. Therefore the power source is a battery of car.

Note 4 : The sample was tested according to the following specifications :

- ANSI C63.10-2013

1.9 Conclusion of worst-case and operation mode

The EUT has three type of modulation (GFSK, π/4DQPSK and 8DPSK).

Therefore all applicable requirements were tested with all the modulations.

The field strength of spurious emission was measured in three orthogonal EUT positions (X-axis, Y-axis and Z-axis).

Tested frequency information,

- Hopping Function : Enable

	TX Frequency (MHz)	RX Frequency (MHz)
Hopping Band	2402 ~ 2480	2402 ~ 2480

- Hopping Function : Disable

	TX Frequency (MHz)	RX Frequency (MHz)
Lowest Channel	2402	2402
Middle Channel	2441	2441
Highest Channel	2480	2480

2. Maximum Peak Output Power Measurement

2.1 Test Setup

Refer to the APPENDIX I.

2.2 Limit

▣ FCC Requirements

The maximum peak output power of the intentional radiator shall not exceed the following :

1. §15.247(a)(1), Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hopping channel, whichever is greater. Alternatively, frequency hopping systems operating in the 2400-2483.5 MHz band may have hopping channel carrier frequencies that are separated by 25 kHz or two-thirds of the 20 dB bandwidth of the hopping channel, whichever is greater, provided the systems operate with an output power no greater than 125 mW.
2. §15.247(b)(1), For frequency hopping systems operating in the 2400 – 2483.5 MHz employing at least 75 non-overlapping hopping channels, and all frequency hopping systems in the 5725 – 5805 MHz band : 1 Watt.

▣ IC Requirements

1. RSS-247(5.4), For FHSS operating in the band 2400 - 2483.5 MHz, the maximum peak conducted output power shall not exceed 1.0 W and the e.i.r.p. shall not exceed 4 W if the hopset uses 75 or more hopping channels the maximum peak conducted output power shall not exceed 0.125 W and the e.i.r.p. shall not exceed 0.5 W if the hopset uses less than 75 hopping channels

2.3 Test Procedure

1. The RF output power was measured with a spectrum analyzer connected to the RF Antenna connector (conducted measurement) while EUT was operating in transmit mode at the appropriate center frequency, A spectrum analyzer was used to record the shape of the transmit signal.
2. The bandwidth of the fundamental frequency was measured with the spectrum analyzer using ;
   Span = approximately 5 times of the 20 dB bandwidth, centered on a hopping channel
   RBW ≥ 20 dB BW
   VBW ≥ RBW
   Sweep = auto
   Detector function = peak
   Trace = max hold

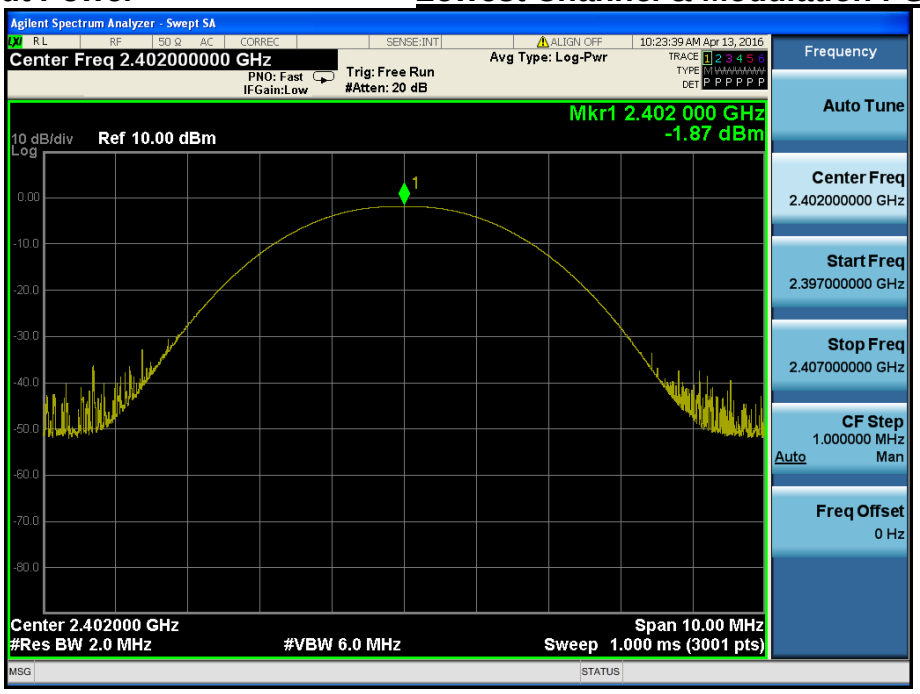
2.4 Test Results

Modulation	Tested Channel	Frame Average Output Power		Peak Output Power	
		dBm	mW	dBm	mW
GFSK	**Lowest**	-2.63	0.546	-1.87	0.650
	Middle	**-2.44**	**0.570**	**-1.52**	**0.705**
	Highest	-2.52	0.560	-1.82	0.658
π/4DQPSK	**Lowest**	-4.33	0.369	-1.16	0.766
	Middle	**-4.17**	**0.383**	-0.76	0.839
	Highest	-4.28	0.373	**-0.46**	**0.899**
8DPSK	**Lowest**	-4.27	0.374	-0.10	0.977
	Middle	**-4.06**	**0.393**	**0.31**	**1.074**
	Highest	-4.19	0.381	0.04	1.009

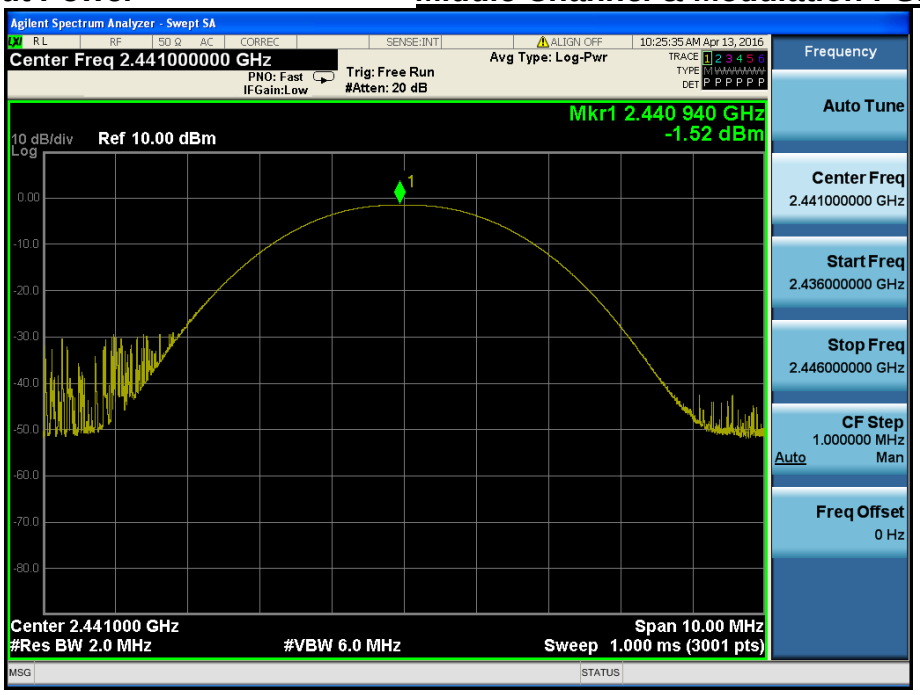
Note 1 : Average output power was using the average power meter for reference only.

Note 2 : See next pages for actual measured spectrum plots.

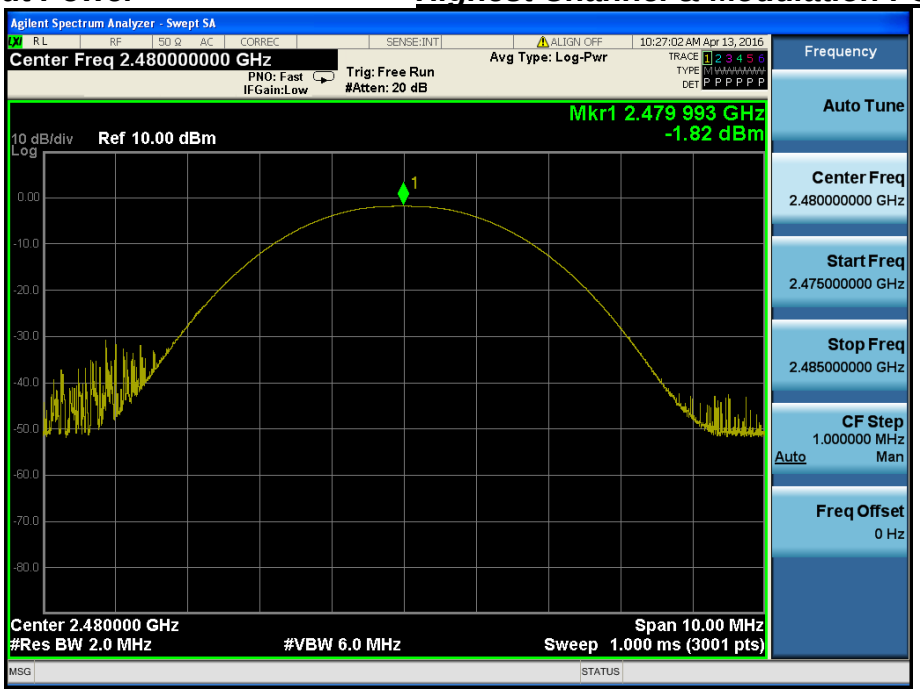
Peak Output Power *Lowest Channel & Modulation : GFSK*



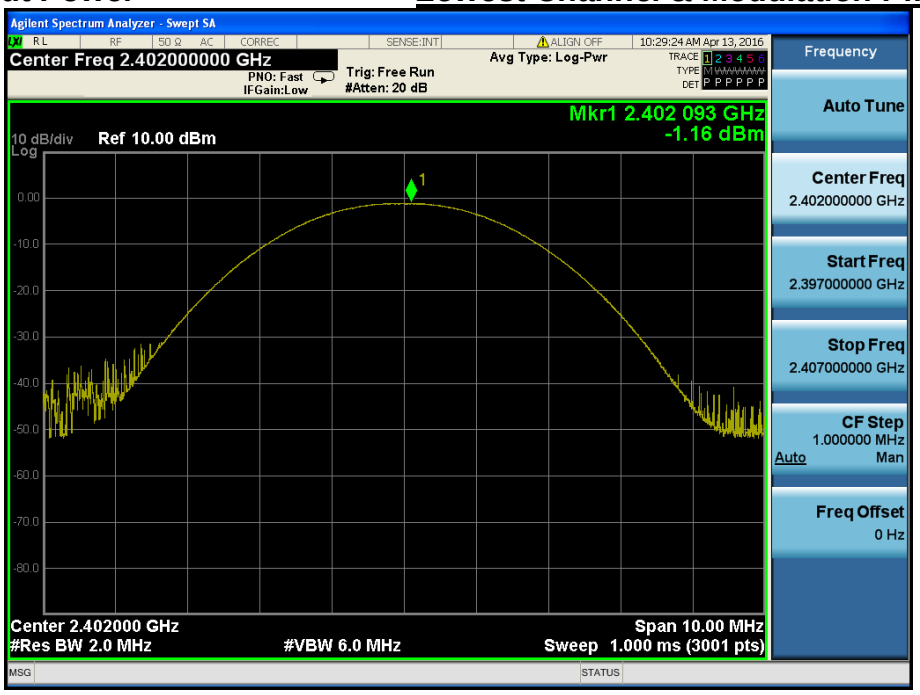
Peak Output Power *Middle Channel & Modulation : GFSK*



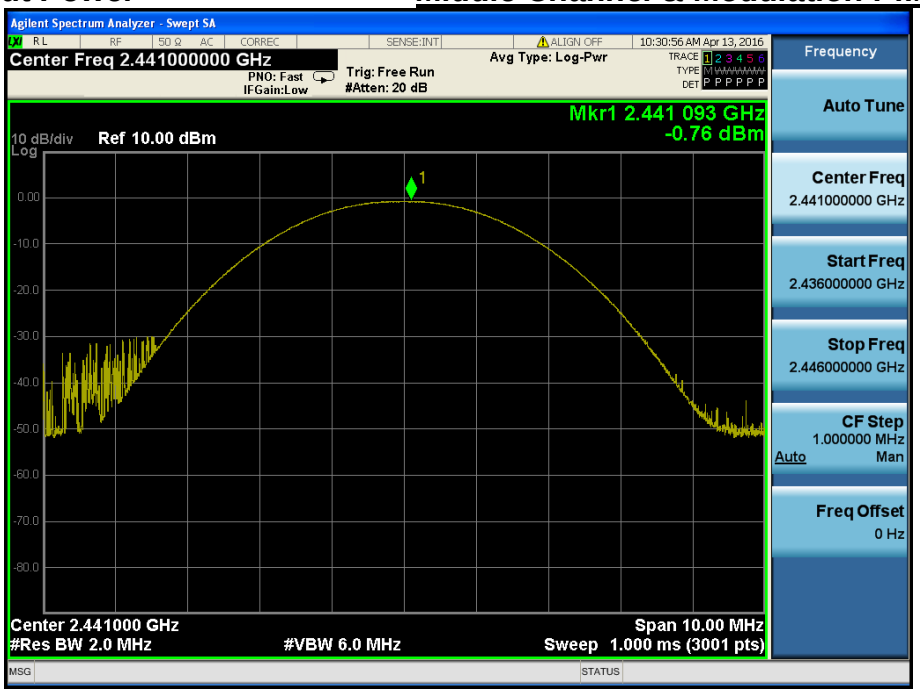
Peak Output Power ***Highest Channel & Modulation : GFSK***



Peak Output Power ***Lowest Channel & Modulation : π/4DQPSK***



Peak Output Power *Middle Channel & Modulation : π/4DQPSK*



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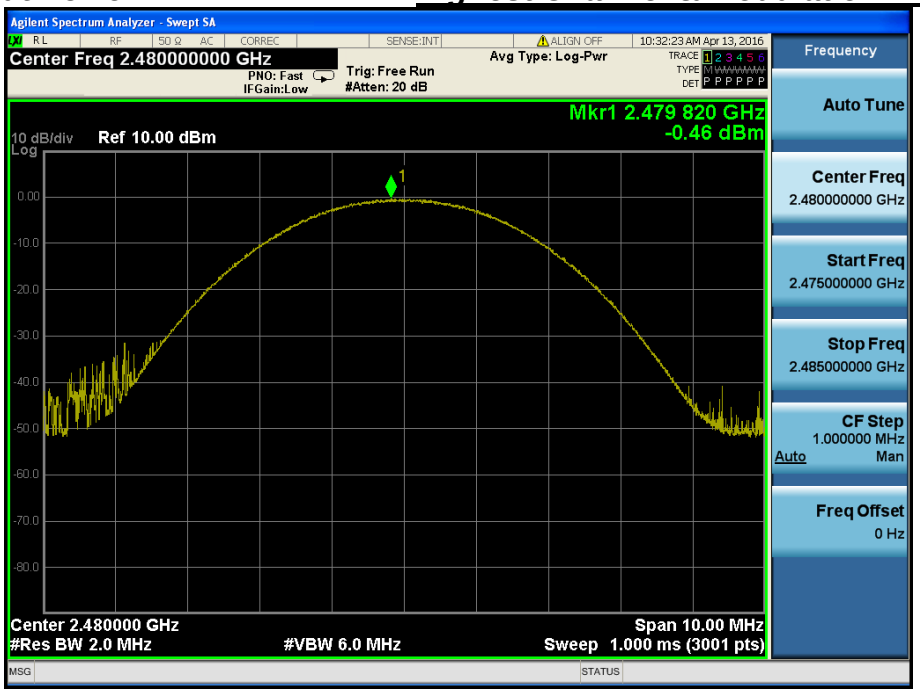
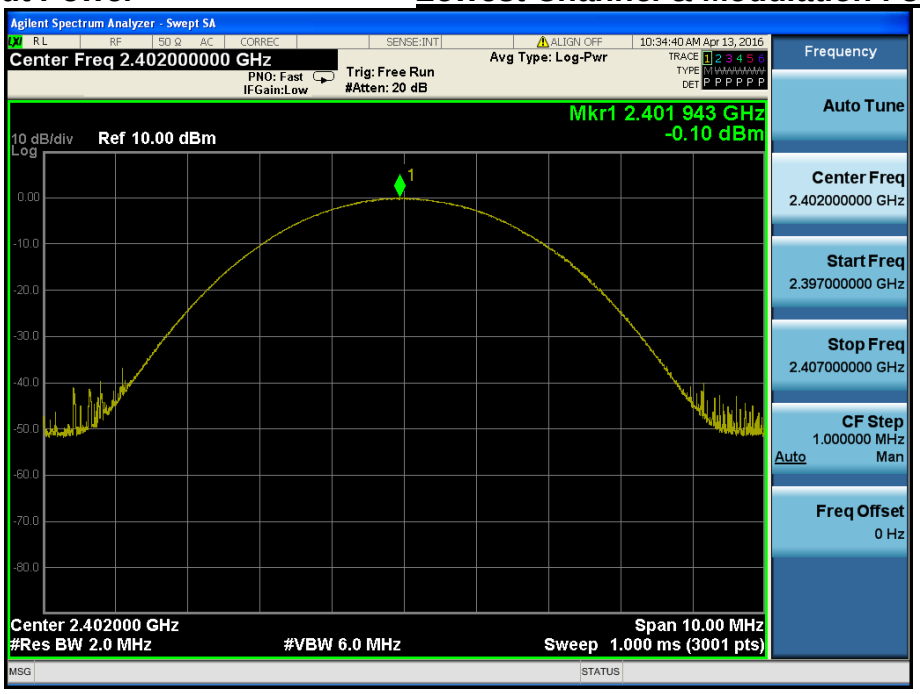
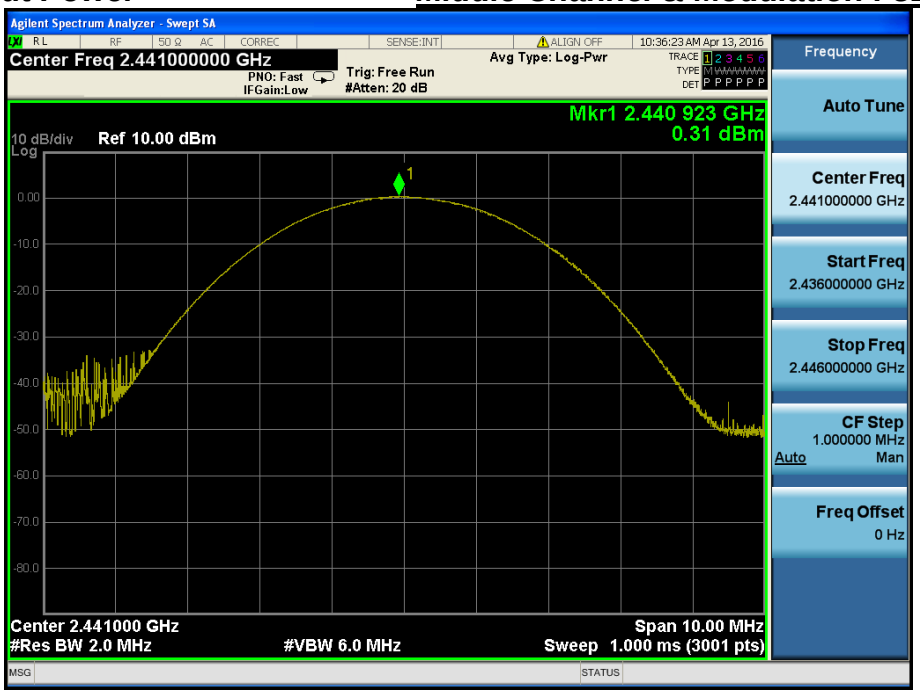


Peak Output Power ***Lowest Channel & Modulation : 8DPSK***



Peak Output Power ***Middle Channel & Modulation : 8DPSK***



Peak Output Power ***Highest Channel & Modulation : 8DPSK***